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APPENDIX A: SITE FIGURES

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Figure #3: Areas of Environmental Concern

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APPENDIX B: CALCULATED MERCURY BACKGROUND CONCENTRATION

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SUPERFUND RECORDS

RD

Site:	St. Louis Army Ammunition Plant
ID#	MO4210021222
Break:	7.0
Other:	ND

07YX

INTRODUCTION

Environmental Operations, Inc. is submitting the following *Remedial Action Plan* ("RAP") for the former St. Louis Army Ammunition Plant ("SLAAP"). This plan is being submitted on behalf of Koman Properties, Inc. ("Developer") which is redeveloping the SLAAP property ("Site"). Currently the Site is in the process of transferring ownership from the United States Army Base Realignment and Closure to the St. Louis Development Corporation ("SLDC"). Eventually ownership of the Site will be transferred to the Developer.

The Site, which formerly produced small arm munitions for the United States Army, is located at 4201 Planned Industrial Drive in the City of St. Louis, Missouri (see Figure #1 located in Appendix A). The Site comprises approximately 21-acres and is roughly bounded by Interstate 70 on the north, Goodfellow Boulevard on the west, Triad Manufacturing on the south and Riverview Boulevard on the east. As a part of the property transfer process, the Site will move environmental regulatory oversight activities from the Missouri Department of Natural Resources ("MDNR") Federal Facilities program and the United States Environmental Protection ("USEPA") Region VII to the MDNR Brownfields/Voluntary Cleanup Program ("VCP").

The following RAP has been prepared to address areas of residual contamination as a result of historic Site activities. The areas of concern ("AECs") are based on the results of previous sampling events (conducted by others). The plan details the actions proposed to address areas of known contamination on the project Site and the cleanup objectives which will be utilized to determine the effectiveness of remedial actions. In general, areas of soil and sewer sediment contamination will be addressed by removal and offsite disposal and various building materials properly abated. Levels of groundwater contamination will be monitored by scheduled sampling events. In addition, imported fill materials will assist in removal of surficial soil pathways.

BACKGROUND¹

The St. Louis Ordnance Plant ("SLOP") was constructed as a 276-acre small arms ordnance plant in 1941. The facility produced .30- and .50-caliber munitions. Approximately 21-acres of the northern portion of the SLOP Site converted production in 1944 to 105-millimeter Howitzer shell production. This portion of the Site became designated as SLAAP.

The SLAAP consisted of the following structures from 1941 to 1944:

- .30-caliber production building (Building 3)
- .30-caliber loading building (formerly Building 202D, currently called Building 5)
- .30-caliber primer insert building (formerly Building 202E, currently referred to as Building 6)

¹ Excerpts from Site-Specific Environmental Baseline Survey, St. Louis Army Ammunition Plant, St. Louis, Missouri, February 2004, URS Group, Inc.

- Powder canning building (formerly Building 202F, later converted to acetylene production, currently referred to as Building 9, which has been demolished)
- Powder storage building (former Building 202H, now demolished)
- Oil storage buildings (202J and 202K, now demolished)
- Guard houses 209 and 209F
- Fire equipment garage (formerly Building 236D, currently referred to as Building 4)
- Underground tunnels from Building 6 to Building 3, Building 5 to Building 3, Building 6 to former Building 203 (currently Triad Manufacturing)

The SLAAP consisted of the following structures after 1944 (see Figure #4):

- Four buildings were converted from .30-caliber manufacturing to Howitzer production (Buildings 3, 5, 6 and 9)
- Remaining buildings were constructed in 1944 (Buildings 1, 2, 4, 7, 8, 10 and 11)
- Building 1 contained billet cutting operations
- Building 2 contained the forging center
- Building 3 contained machining operations (now demolished)
- Air compressors were stored in Building 4
- Office and laboratory operations were in Buildings 5 and 6
- Non-contact waters from manufacturing operations were cooled in Buildings 7 and 7A
- Buildings 8 and 8A contained fuel oil for rotary furnaces in Building 2 (now demolished)
- Acetylene was generated in Buildings 9 and 9A-9D
- Quench oil was stored in Building 10 (now demolished)
- Fire suppression materials were generated in Buildings 11, 11A and 11B

In general, Site manufacturing operations were related to shell demand. The facility was placed on standby in 1945, following World War II. The Korean Conflict and Vietnam War reactivated the Site from 1951 through 1954 and 1966 through 1969. In approximately 1984, several onsite buildings were renovated to house filing and administrative operations by a division of the United States Army. In 1989, the Site was determined no longer required for support services. By 1998 the Site was vacant.

Several Site investigations have been performed in the past. Tetra Tech EM, Inc. performed a *Comprehensive EBS* in 2000. Several subsequent intrusive Site investigations were performed by Tetra Tech EM, Inc. and URS Group, Inc. In addition, remediation activities were conducted related to regulated underground storage tanks and the former Building 3. Results of these investigations were reviewed for preparation of this RAP.

AREAS OF ENVIRONMENTAL CONCERN & CONTAMINANTS OF CONCERN

Previous environmental activities have identified the following AECs:

- Impacted Subsurface Soils: Soil contaminants have been identified in the shallow soil horizon (existing surficial soils and subsurface soils above the shallow groundwater table).
- Asbestos Containing Materials ("ACM"): Various ACMs are present within several onsite structures across the Site.
- Lead Based Paint ("LBP"): Several existing onsite structures contain varying amounts of LBP.
- Miscellaneous Building Items: Existing surface debris in Building 2 (surface sediment and debris piles) may contain elevated levels of contaminants. In addition, miscellaneous environmental items (light bulbs, light ballasts, light fixtures, thermostats, etc.) are also present within onsite structures. Investigative derived wastes from previous Site investigations are also staged onsite.
- Existing Sewer Lines: Elevated levels of contaminants have been detected within the onsite subsurface sewer systems during previous Site investigations.
- Onsite Shallow Groundwater: Elevated levels of contaminants have been detected during one previous sampling event of the onsite shallow groundwater monitoring wells.

Each soil AEC consists of an area approximately 25 feet by 25 feet (625 square feet) centered on a previous soil sampling location having analytical results greater than project cleanup objectives. The vertical extent of each AEC will be based on the results of the previous investigations.

Historic environmental investigations have identified the following contaminants of concern ("COC") for the Site:

- Petroleum constituents: Polynuclear Aromatic Hydrocarbons ("PAH"), Total Petroleum Hydrocarbons ("TPH")
- Total Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium and zinc)
- Dioxins
- Polychlorinated Biphenyls ("PCB")
- Pesticides
- Volatile Organic Compounds ("VOC")
- Asbestos
- LBP

Areas of concern across the project Site include specific COCs for that area, based on historic environmental laboratory analyses. Subsequent sections of this document provide detailed information on the AECs and the associated COCs.

REMEDIAL ACTION PLAN – IMPACTED SUBSURFACE SOILS

The following sections describe the remedial actions to be implemented and detail the associated items to conduct environmental remediation of onsite soils. Areas of soil remediation are detailed on Figure #3.

Please note that the results of the next phase of site investigation may indicate additional areas of remediation. If necessary, this RAP will be amended to reflect these additional areas.

Site Preparation

Within the project Site, areas of soil contamination will be identified and delineated with construction fencing, flagging and/or caution tape. Decontamination of equipment and personnel, if determined necessary by the Site Supervisor and/or Health and Safety Officer, will occur prior to movement from an area of known contamination.

Entry and exit from each area of environmental concern will be restricted and the proper level of protection will be required within each designated area. Required personal protective equipment ("PPE") will be detailed in the *Site Specific Health and Safety Plan*.

Remedial Action Technology

Excavation and proper offsite disposal will complete remediation of impacted soils. It is anticipated that excavated soils will be classified as special waste soils and can be disposed in a Subtitle D facility. Analysis of landfill profile samples will determine the disposition of impacted materials. Excavation will be conducted using standard hydraulic excavators and/or other excavation equipment. Areas of impacted soils may be stockpiled onsite as part of soil removal actions. The practice of stockpiling impacted materials will be kept at a minimum.

The depths of the initial excavation lifts are based on identified contaminants within each AEC. If subsequent lifts are required to meet soil Site cleanup objectives, the additional lift will be approximately one foot in thickness. Depending upon remediation depths and previous soil samplings documentation, these previous sampling data may be used for confirmation. If additional sidewall contamination is found above Site cleanup objectives, the excavation will extend laterally in that direction approximately five additional feet.

Soil remediation areas will not extend vertically below the shallow groundwater table. Confirmation soil samples will not be collected from areas of excavations which are below the shallow groundwater table or areas which are not on the VCP project Site.

Existing surface soils which will not have three feet of imported materials placed may be excavated and placed in other locations of the Site where the fill import will exceed three feet, or properly disposed offsite. This procedure will eliminate the surficial soil pathways from the project cleanup objectives.

Confirmation Soil Sampling and Analysis Program

Confirmation sampling will be performed to demonstrate compliance with the project remediation objectives. An accredited, offsite laboratory will analyze collected confirmation samples for the necessary parameters for each AEC. All collected confirmation samples will be discrete.

Soil excavations will be guided in the field based on the chemical results of previous Site investigations. When a portion of an excavation reaches the specified initial remediation depth, a sample representative of that portion of the excavation will be collected and analyzed for the appropriate COCs. Samples will be obtained from 6 to 12 inches into undisturbed material in each location. Sample density will occur at the rate of one sample for every 25-foot by 25-foot area of excavated floor soil (625 square feet). Confirmation soil samples will be collected every 25 linear feet along each excavation wall. Confirmation excavation sidewall sampling will occur when excavation walls are greater than one foot in depth.

Confirmation soil samples will only be collected on the VCP project Site. Confirmation soil samples will not be collected from those areas of excavation that extend to the project Site property lines, as these samples would be classified as offsite.

Samples will be placed in pre-cleaned, properly preserved glassware and staged in an iced cooler pending transport to the laboratory. All collected samples will be discrete and results compared to the applicable Site cleanup objectives. Compliance will be achieved if the analytical results from each sample are less than the applicable cleanup levels.

Confirmation samples will be analyzed for the COCs for each specific AEC. Confirmation samples will be analyzed by the one or more of the following analytical methods, based upon the results of historic sampling activities:

- Total Lead using USEPA Test Method 6010;
- Total Mercury using USEPA Test Method 7470.

REMEDIAL ACTION PLAN – ASBESTOS CONTAINING MATERIALS

The following sections briefly describe the remedial actions to be implemented to conduct environmental remediation of ACMs which have been identified across the project Site. More detailed information on the extent and quantity of ACM has been detailed in reports previously provided to MDNR.

Site Preparation

A pre-notification will be submitted to the City of St. Louis Air Pollution Control for all regulated removal of asbestos across the Site. Depending on the type of ACM to be removed prior to demolition, preparation may include set-up of critical barriers, negative air machines, decontamination units, use of personal respirators and suits, proper signage to designate regulated areas and drop poly. The type of ACM to be removed and the technique will determine the appropriate preparation activities. The *Site Specific Health and Safety Plan* will detail the personal protective equipment necessary for all ACM abatement personnel.

Remedial Action Technology

All identified ACMs will be removed prior to demolition of onsite structures. Materials will be removed using various techniques which will be based upon the type of material to be abated and the material accessibility. Materials will be properly profiled for offsite disposal. All disposal containers used for transportation of regulated ACMs will be double lined with a minimum of 4-mil polyethylene sheeting. Once the debris is placed within the container, the material will be covered with a minimum of 4-mil polyethylene sheeting. During the course of abatement activities, water will be used at all times per the requirements of local, state and federal regulations during ACM abatement activities.

Confirmation Air Sampling and Analysis Program

Confirmation ambient air sampling will be performed to demonstrate compliance with local air quality standards. Following removal of ACMs, a final Site walkthrough will occur to verify the completion. If additional ACMs are encountered during the walkthrough or during subsequent Site redevelopment activities, the above referenced activities will be continued. Asbestos fiber levels in areas adjacent to the work area will not exceed 0.01 fibers per cubic centimeter of air ("f/cc") by PCM analysis or background levels as determined by phase contrast microscopy. Work will immediately cease in any work area causing or contributing to environmental concerns.

REMEDIAL ACTION PLAN – LEAD BASED PAINT

Areas of LBP identified during previous investigations will be addressed by demolition. Building debris with attached LBP will be properly disposed offsite.

REMEDIAL ACTION PLAN – MISCELLANEOUS BUILDING ITEMS

Site investigations have identified miscellaneous environmental items within the onsite buildings which require removal prior to Site demolition activities. These items may consist of existing light tubes, ballasts and mercury containing thermostats. In addition, several existing buildings contain staged excavated soils (Building 2) and 55-gallon drums from previous Site investigations.

Miscellaneous Building Items

All existing environmental items will be removed from the onsite structures. Light tubes, ballasts, thermostats, smoke detectors, refrigeration units and miscellaneous debris will be containerized and staged onsite for subsequent offsite disposal.

Existing steel structures within Building 2 have been documented to contain elevated levels of PCBs and dioxins. Information provided to Environmental Operations, Inc. indicates MDNR has approved disposal of this material at a local scrap recycler for remelt purposes. This documentation will be provided to Environmental Operations, Inc. from MDNR prior to site mobilization.

Building 2 Debris Piles

Several stockpiles of excavated soils from previous Site investigations exist within the Building 2 footprint. In addition, this building contains residual sediment on the concrete floor from historic Site operations. As a part of Site development, the debris located on the concrete floor will be profiled for offsite disposal. The material will be removed using hydraulic skid steers and placed in appropriate vehicles for transport to the disposal facility. Residual debris and/or sediment may be removed from the concrete floor using high pressure water or skid steer sweeping attachments. Since the surface debris will be removed to the existing concrete surface, no confirmation sampling is planned.

Investigative Derived Wastes

Several 55-gallon drums are located in various buildings across the Site. The drums are related to the previous Site investigation activities. Conversations with the MDNR have indicated that these items will be removed from the project Site, by others, prior to Site development and remediation mobilization. If these items are not removed from the Site at the completion of redevelopment activities, the materials will be properly disposed as a part of the current remedial actions.

REMEDIAL ACTION PLAN – EXISTING SEWER LINES

Previous environmental Site investigations have identified elevated levels of contaminants within the onsite sewer system. Subsequent subsurface soil sampling conducted along the flow lines of the sewer lines has not identified levels of contaminants above Site cleanup objectives. As a part of redevelopment, the existing Site sewer lines which have been identified during the previous investigations as containing elevated levels of contaminants will be addressed. Removal of these elevated sediments will prevent possible future migration to the onsite soils and/or groundwater.

The lines of concern are identified on the attached Figure #3.

Remedial Action Technology

The lines identified on Figure #3 will be jetted clean of sediments with high pressure water. At select sewer inlets, high pressure water will be introduced to the sewer system. At the most downgradient sewer location onsite, the introduced water and sewer line sediment will be containerized utilizing a vacuum truck.

Generated wastes from this process will be properly disposed. It may be necessary to stage the captured liquids and sediments in temporary onsite containment structures, prior to disposal. Upon completion of remedial actions, the Site general contractor may choose to abandon the lines in-place or physically remove the lines from the subsurface.

Confirmation Soil Sampling and Analysis Program

Previous Site investigations included soil sample collection along the sewer flow line of the onsite sewers. A review of the results did not indicate contaminant concentrations greater than onsite cleanup objectives.

Upon completion of sewer remediation activities, select locations will be inspected using sewer line cameras. If additional sediments are identified during the camera inspections, additional remedial actions will be conducted. Camera inspections will be recorded and provided as documentation of the effectiveness of the removal efforts.

REMEDIAL ACTION PLAN – ONSITE SHALLOW GROUNDWATER

Previous Site investigations identified elevated levels of total metals and VOCs within the shallow onsite groundwater. Historic information provided for review only indicated one round of sampling of the groundwater had been performed. Two additional groundwater sampling events are proposed to monitor the levels of contaminants within the onsite groundwater. Existing monitoring wells are identified on Figure #4. Please note that additional shallow groundwater monitoring wells are proposed as part of the additional Site sampling. These newly installed wells will become part of the monitoring program.

Groundwater Monitoring

The existing groundwater monitoring wells will be sampled during two proposed sampling events. The first event will occur once approval of this plan is received from the MDNR VCP. The second event will occur approximately three months later. Upon evaluation of the results from the proposed sampling events, the possible need for additional sampling to determine onsite extent and/or offsite migration issues, will be discussed with the MDNR VCP.

Monitoring wells will be properly purged prior to collection of representative groundwater samples. Samples collected for metals analyses will be field filtered prior to collection using 0.45 micron field filters. Collected groundwater samples will be analyzed for the following parameters:

- Dissolved Metals using USEPA Test Method 6010/7470;
- PAHs using USEPA Test Method 8270;
- VOCs using USEPA Test Method 8260.

REMEDIAL OBJECTIVES

Soil remediation objectives ("RO") for the Site are based on the *Missouri Risk-Based Corrective Action ("MRBCA") Process for Petroleum Storage Tanks* (January 28, 2005) and the *Draft Departmental MRBCA Technical Guidance* (February 2005). Previous analytical results have been compared to the Tier 1 Risk-Based Target Levels for Residential Land Use Soil Type 1 (Sandy). Within the Tier 1 Target Levels, concentrations have been compared to the Indoor Inhalation of Vapor Emissions for Subsurface Soils and the most stringent pathway values for Surficial Soils [Ingestion,

Inhalation, (Vapor Emissions and Particulates), and Dermal Contact]. These comparisons are the most stringent values for sites where the Domestic Groundwater Use is not a pathway of concern.

During the previous Site investigations, local background soil samples were collected and analyzed for total metals and PAHs. Analytical results of these samples were used to calculate Site specific background soil concentrations for total mercury. Details of the calculations are included in Appendix B of this RAP. The calculated background concentration of 0.139 mg/Kg will be used for total mercury confirmation sample comparisons during Site remediation activities.

Proposed redevelopment of the Site includes importing and placing over 120,000 cubic yards of fill. The placement of this fill will eliminate the surficial soil pathway over a majority of the Site. This pathway will not be investigated in areas where a minimum of three feet of fill are placed or in areas where existing surficial soil pathway target levels are achieved. Areas where import of three feet of material is not anticipated, surficial soils in these areas may be excavated and relocated onsite in areas beneath three feet of placed fill, or properly disposed offsite. This method may involve removal of soils so that existing Site soils will be covered with three feet of imported soils. In addition, these removed soils will be investigated for the potential of indoor air inhalation pathway concerns within the area of relocation.

All collected confirmation soil samples will be compared to the Residential Tier 1, Soil Type 1 lookup tables in the MRBCA documents. Comparison to these values will result in residential classification of the Site by the MDNR.

Groundwater concentrations will also be compared to Tier 1 Risk-Based Target Levels for Residential Land Use for Soil Type 1 (Sandy). Currently, the following statements apply to the onsite shallow groundwater:

- there are no future plans to significantly modify the subject Site from commercial/light industrial to any other land use which would allow installation of groundwater drinking wells;
- Site has an intensive historic industrial/commercial history
- Site is located within a metropolitan area with a population of at least 70,000 in 1970;
- The groundwater zone is in hydraulic communication with industrial/commercial surface activities
- Shallow groundwater will likely not meet suitability for use due to yield criteria to be considered a viable water supply source.

Based on the above statements, the Domestic Water Use and the Dermal Contact pathways can be eliminated for the Site. All groundwater analytical results will be compared to the Indoor Inhalation of Vapor Emission pathway. Currently, it will be assumed that the entire Site may contain a building in the future in which the Indoor Inhalation of Vapor Emission pathway may be a concern. Based on development of the Site, this pathway may only be of concern in areas with planned building development.

Reuse levels for disturbed soils and onsite concrete are proposed to be the same as the Site cleanup objectives. Disturbed soils with analytical results greater than the surficial soil ROs, as stated in the MRBCA documents, will be required to be placed at depths greater than three feet below ground surface.

Areas of proposed Site development and construction will be compared Tier 1 Risk-Based Target Levels for the Construction Worker for Soil Type 1 (Sandy). Areas of proposed utility corridors may be "cleared" by the environmental contractor by removing the in-place soils and placing in other areas of the Site beneath the imported fill materials. These corridors would remain open for the general/utility contractor.

EXCAVATION WATERS AND SURFACE WATERS

If wastewaters are encountered within the Site excavations due to accumulation of surface runoff and/or groundwater, and it inhibits redevelopment activities, it will be removed and properly disposed. These wastewaters may be discharged, under permit, into the local sewer system ("POTW") if analytical results meet discharge requirements. If analytical results do not meet discharge requirements, onsite filtering or treatment may occur, or the material may be disposed offsite. Treatment or filtering of wastewaters to be discharged to the local POTW will be under the direction and regulatory supervision of the Metropolitan St. Louis Sewer District ("MSD").

HEALTH AND SAFETY PLAN

A *Site Specific Health and Safety Plan* will be prepared which addresses Site activities, COCs and associated risks. The plan details the protection required for onsite personnel and necessary steps to decontaminate remediation equipment. The plan also includes directions to the nearest emergency medical facility. A copy of the plan will remain on the project Site at all times when remediation activities are being conducted. All Site workers and visitors will be required to review the plan prior to entering the remediation areas.

In the course of redevelopment activities, it may be necessary to implement dust control actions. If this is deemed necessary by the Project Health and Safety Officer, water will be used to dampen the work areas to prevent the spread of wind-borne contaminants to the air. Care will be taken to prevent over-saturation.

DISTURBED SOILS MANAGEMENT PLAN

Upon completion of site remedial activities, onsite soils will meet residential levels. Based on ongoing discussions with MDNR and the continual updating of the MRBCA guidance documents, it will be necessary to implement a disturbed soils management plan. This plan would address the actions which would be required if subsurface soils are not returned to their original depths. The plan would also address the potential for the construction worker pathway. This plan will be prepared and submitted under separate cover or as an addendum to this document once development plans have been finalized and additional site sampling documentation is complete.

IMPORTED FILL MATERIALS

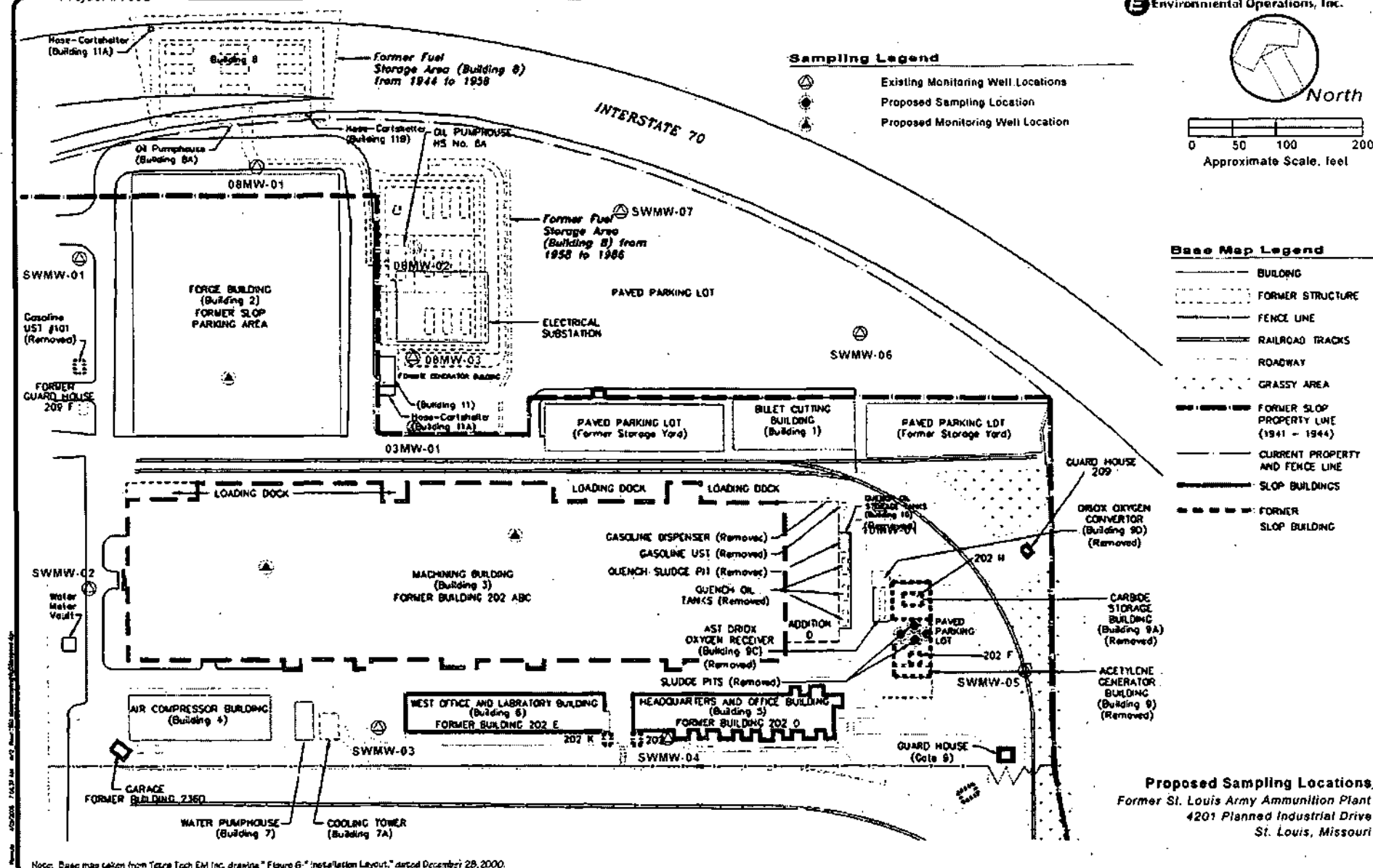
Current redevelopment plans involve the import and placement of over 120,000 cubic yards of material over the Site. This material will act to remove the surficial soils pathway from a majority of the Site. The Indoor Inhalation of Vapor Emissions for Subsurface Soils will be the only pathway of concern in areas of the Site where there is a minimum of three feet of overburden materials.

Currently, the source of the imported materials is unknown. Information regarding the source of the fill material, which may include previous environmental documentation, will be provided to the MDNR VCP prior to import activities to the Site to determine what additional investigation of the material, if any, would be considered appropriate. Based on the type of material and the borrow source, confirmation soil sampling may be necessary to demonstrate reuse potential. The MDNR VCP will be requested to provide approval on the imported materials.

FINAL REPORT OF REMEDIAL ACTIONS

Upon completion of remediation activities, a final report will be prepared and submitted to the MDNR VCP. The report will include procedures, field and laboratory data, associated remediation documentation and scaled drawings. The report will summarize remediation activities and provide sufficient information in order for the MDNR VCP to issue a letter of completion concerning onsite environmental issues.

Interim remedial completion reports may be prepared after significant environmental activities. Based on the VCP applicants requirements, interim certificates of completion may be requested from the MDNR VCP.



Note: Base map taken from Tetra Tech EM Inc. drawing "Figure 6 - Installation Layout," dated December 28, 2000.

INTRODUCTION

Environmental Operations, Inc. is submitting the following *Proposed Additional Sampling Plan* ("Sampling Plan") for the former St. Louis Army Ammunition Plant ("SLAAP"). This plan is being submitted on behalf of Koman Properties, Inc. ("Developer") which is redeveloping the SLAAP property ("Site"). Currently the Site is in the process of transferring ownership from the United States Army Base Realignment and Closure to the St. Louis Development Corporation ("SLDC"). Eventually ownership of the Site will be transferred to the Developer.

The Site, which formerly ^{and 105 howitzer shells} produced small arm munitions ^{17 acres} for the United States Army, is located at 4201 Planned Industrial Drive in the City of St. Louis, Missouri (see Figure #1 located in Appendix A). The Site comprises approximately 21-acres and is roughly bounded by Interstate 70 on the north, Goodfellow Boulevard on the west, Triad Manufacturing on the south and Riverview Boulevard on the east. As a part of the property transfer process, the Site will move environmental regulatory oversight activities from the Missouri Department of Natural Resources ("MDNR") Federal Facilities program and the United States Environmental Protection ("USEPA") Region VII to the MDNR Brownfields/Voluntary Cleanup Program ("VCP").

The following Sampling Plan has been prepared to address areas with limited historic environmental investigation information. The areas of concern ("AECs") are based on the results of previous sampling events (conducted by others). In addition, there is an open MDNR Leaking Underground Storage Tank ("LUST") file for this Site.

AREAS OF ENVIRONMENTAL CONCERN

Significant amounts of environmental investigation have been performed on the Site. After a review of available historic sampling documentation, there appears to be a few onsite areas with limited documentation concerning the environmental quality. There is also a need for closure of the open MDNR LUST with regard to the former regulated underground storage tanks ("USTs"). These areas are as follows:

- AEC #1 – Sludge Pits, East of Former Building 3
- AEC #2 – Shallow Groundwater, Proposed Building Locations
- AEC #3 – Building 2 Concrete Floor
- AEC #4 – Regulated USTs

This investigation is designed to determine if the above referenced locations have been significantly impacted due to historic Site activities. The proposed sampling locations are indicated on the attached Figure #2.

AEC #1 – SLUDGE PITS

Two sludge pits are identified on Site plans in previous environmental reports. The pits are located east of Building 3. Little environmental data has been located regarding the closure of

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APPENDIX A: SITE FIGURES

Figure #1: Project Site Plan

Figure #2: Proposed Sampling Locations

DRAFT

*Former St. Louis Army Ammunition Plant
4201 Planned Industrial Drive
St. Louis, Missouri*

these pits. Additional sampling is proposed in this area to determine the environmental quality of subsurface soils in the area.

Four soil sample locations are proposed in the vicinity of the former sludge pits. Soil sampling locations will be advanced with standard auger drilling equipment, utilizing 3.75 inch hollow stem augers. Continuous soil samples will be collected from each borehole using split spoon sampling equipment. All samples will be field-screened using a photoionization detector ("PID") with readings and lithologic descriptions recorded on soil boring logs. Soil borings will extend to auger refusal or top of the shallow groundwater table, whichever is encountered first.

The most likely impacted soil sample from each boring location, based on field indicators of contamination, PID headspace readings and contaminant characteristics, will be collected for analytical testing. In addition, one sample will be collected from each location from 0-3 foot bgs. Sample collection and field preservation for volatile organic soil samples will be in accordance with United States Environmental Protection Agency ("USEPA") Method 5035. The soil samples (eight total) will be analyzed for the following parameters:

- Diesel Range Organics/Oil Range Organics ("DRO/ORO") using USEPA Test Method 8270;
- Polychlorinated Biphenyls ("PCB") using USEPA Test Method 8082;
- Volatile Organic Compounds ("VOC") using USEPA Test Method 8260;
- Polynuclear Aromatic Hydrocarbons ("PAH") using USEPA Test Method 8270;
- Total Metals (arsenic, barium, cadmium, chromium, lead, silver, selenium and mercury) using USEPA Test Method 6010/7470;

AEC #2 – SHALLOW GROUNDWATER

A total of 13 monitoring wells exist on the Site, based on a review of previous environmental reports (see attached Figure). The previous environmental documentation indicated that only one round of groundwater sampling was conducted across the Site. Elevated levels of contaminants were detected during this one round of sampling. It appears the metals samples analyzed as a part of the previous investigation were not field filtered.

As a part of the current investigation, three additional shallow groundwater monitoring wells will be installed. In general, the locations have been determined based on the results of the previous investigations and the proposed locations of future development. The attached Figure #2 indicates the location of the proposed monitoring wells. The new wells shall be constructed and registered according to Missouri Well Construction Rules, June 1996, using 2-inch diameter Schedule 40 PVC riser pipe and #10 (0.010-inch) slotted well screens. Riser pipes inside above-ground well protectors shall be installed approximately three feet above ground surface and embedded in concrete.

Soil samples will be collected continuously from each monitoring well location for description purposes only. Soil samples will not be analyzed offsite for laboratory analysis.

Groundwater sampling activities are addressed in the project *Remedial Action Plan*. No groundwater sampling is proposed as a part of this Sampling Plan.

AEC #3 – BUILDING 2 CONCRETE FLOOR

Several concrete surface samples were collected during previous site investigations. Recent discussions with the MDNR project team have indicated that the historical sampling density is not adequate to fully characterize the existing main floor surface. As a part this investigation, additional surface concrete sampling will be conducted to adequately characterize the building.

The building footprint will be divided into sampling sections. A total of 10 concrete samples were collected during the previous investigations. Sampling sections with an identified previous sampling location will not be further sampled. Each sampling section will consist of an area 50 feet by 50 feet in size (2,500 square feet). Within each section, 625 square foot grids will be laid out. One discrete sample will be collected from each 625 square foot section. The four discrete samples from each 50 foot square sampling section will be composited to form one sample for that section. It is anticipated that a total of 19 composite surface concrete samples will be collected. Each sample will be analyzed for the following parameters:

- PCB using USEPA Test Method 8082.

Concrete samples will be collected from the surface to approximately three inches into the concrete. Surface debris will be cleared prior to sample collection.

AEC #4 – REGULATED USTs

Available files from the MDNR Tanks Section were reviewed concerning the subject Site. In general, several tanks were located along the eastern side and one tank in the northwest corner of the former Building 3. Based on confirmation soil sampling data, a release was reported to MDNR. Several corrective actions were implemented to address the release. Soil issues related to the tank located northwest of Building 3 appear to have been resolved. A significant amount of soil remediation was also conducted in the area of the other tanks. It appears that limited confirmation sampling was conducted after remedial activities beneath the tanks (excavation floor) in this area. The most recent site investigation (conducted by URS) included several sample locations in the vicinity of the former tanks on the east side of the former Building 3. Review of these analytical results does not indicate a widespread release of petroleum constituents at levels above the anticipated Site cleanup objectives.

Prior to implementation of this Sampling Plan, documentation of historic environmental activities and a request to close the Site LUST file will be forwarded to the MDNR Tanks Section with a copy submitted to the VCP. If during discussions with the MDNR, it is determined that additional sampling is necessary to properly close this issue, a sampling plan will be prepared and forwarded to MDNR.

INVESTIGATIVE DERIVED WASTES

Soil cuttings will be placed in soil bags and water generated during investigative activities will be placed in 55-gallon drums and stored onsite. Personal protective equipment will be placed in trash bags for disposal as municipal waste. Generated investigative wastes will be disposed during site remediation/development.

*Former St. Louis Army Ammunition Plant
4201 Planned Industrial Drive
St. Louis, Missouri*

SITE SURVEY AND GROUNDWATER FLOW DETERMINATION

Horizontal coordinates will be surveyed for all soil borings and monitoring wells such that they could be located on a map relative to data points from previous sample locations. Ground surface elevations will be measured for all new monitoring wells and soil borings. Top-of-casing elevations will be measured for all new monitoring wells, as well as groundwater elevation readings. This data will be utilized for determination of groundwater flow direction.

REPORT OF FINDINGS

A report of findings and results will be prepared and submitted to VCP after completion of fieldwork and review of analytical laboratory data. The report will include bore logs, scaled site drawing, analytical laboratory data and conclusions.